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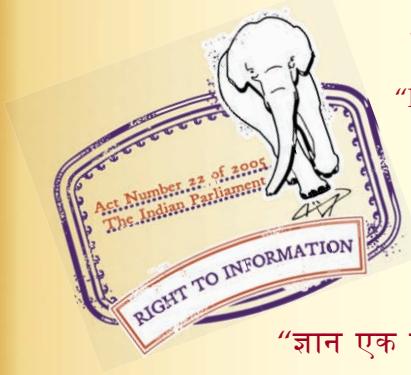
“Step Out From the Old to the New”

IS 5223 (1993): Oilseeds milling machinery - Oil expellers
- Test code [FAD 20: Agriculture and Food Processing
Equipments]

“ज्ञान से एक नये भारत का निर्माण”

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“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

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“Knowledge is such a treasure which cannot be stolen”



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परीक्षण संहिता

(पहला पुनरीक्षण)

Indian Standard

OILSEEDS MILLING MACHINERY —
OIL EXPELLERS — TEST CODE

(*First Revision*)

UDC 665.1.05.001.34 : 620.1

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BUREAU OF INDIAN STANDARDS
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FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Agricultural Produce Milling Machinery Sectional Committee had been approved by the Food and Agriculture Divisional Council.

Oilseeds milling is one of the major industries in India. The main machinery employed in the process of oil milling consists of power GHANIS, and expellers. Expellers are by far the most common machinery employed in extracting oil from most of the oilseeds like groundnut, linseed, rapeseed, mustard, etc.

This standard was first published in 1969 covering methods of test with regard to oil content of residual cake and power consumption at no load. Since then, improvements have been made in extracting more oil from seed and thrust has been given in conserving the energy. Therefore a need was felt to revise the standard to provide more elaborate procedure for conducting the test including consumption of power at load and linking the capacity with extraction efficiency. A list of Indian Standards on oilseeds and oils to which the millers and testing authorities may be interested is given in Annex A for guidance.

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated is to be rounded off, it shall be done in accordance with IS 2 : 1960- 'Rules for rounding off numerical values (*revised*)'.

Indian Standard

OILSEEDS MILLING MACHINERY — OIL EXPELLERS — TEST CODE

(First Revision)

1 SCOPE

This standard prescribes method for testing of oil expellers.

2 REFERENCE

The following Indian Standards are necessary adjuncts to this standard:

IS No.	Title
3579 : 1966	Methods of test for oil seeds
4427 : 1967	Grading for groundnut kernels for oil milling and table use
4428 : 1967	Grading for mustard seeds for oil milling
7874 (Part 1) : 1975	Method of test for animal feeds and feeding stuffs : Part 1 General method

3 TERMINOLOGY

3.0 For the purpose of this standard, the following definition shall apply.

3.1 Capacity

The quantity of the oil seed crushed kg/h with 8 percent maximum extraction of oil in two stages of crushings and without change of acid value of oil from its original value.

NOTE — The capacity may be declared with respect to groundnut kernels (see IS 4427 : 1967).

3.2 Foreign Matter

It includes inorganic and organic matter. The inorganic matter shall include sand, gravel, dirt, pebbles, stones, lumps of earth, mud and iron chips. The organic matter shall include chaff, straw, weed, seed, dead insects, worms and other grains.

4 SELECTION AND SPECIFICATION OF OIL EXPELLERS

4.1 Selection

For Commercial test report or for certification purpose, the oil expeller shall be selected from the series production by the testing authority.

For prototype testing or for confidential test report, the oil expeller shall be submitted by the manufacturer.

4.2 Specification and Other Literature

The manufacturer shall provide all literature, operational manual and specification sheet as given in Annex B duly filled in. The manufacturer shall indicate the maximum input capacity, rated capacity and output capacity and furnish any further information which might be required to carry out the tests.

5 TESTS

5.1 General

- a) Checking of specification,
- b) Checking of material, and
- c) Visual observation and checking of provision for adjustment.

5.2 Test at No Load

- a) Power consumption, and
- b) Visual observation.

5.3 Test at Load

- a) Determination of the oil content of residual cake,
- b) Determination of acid value in oil,
- c) Power consumption,
- d) Determination of capacity, and
- e) Visual observation.

5.4 Long-Run Test

6 PRE-TEST OBSERVATIONS

6.1 Determination of the Foreign Matter

The seed mass shall be physically examined in accordance with 4 of 3579 : 1966.

6.2 Determination of Moisture Content

The moisture content of the seed mass shall be determined in accordance with 5.1 of IS 3579 : 1966.

6.3 Determination of Oil Content

The oil content of the oil seed shall be determined in accordance with 5.2 of IS 3579 : 1966.

6.4 Determination of Acid Value of the Extracted Oil

The acid value of the extracted oil shall be determined in accordance with 5.3 of IS 3579 : 1966.

7 RUNNING-IN AND PRELIMINARY ADJUSTMENTS

7.1 The oil expeller shall be installed on level and preferably on hard surface. All the adjustments shall be made in accordance with the manufacturer's recommendations.

7.2 The expeller shall be attached with a suitable prime mover preferably with an electric motor of capacity recommended by the manufacturer and auto voltage stabilizer. An energy meter or some form of transmission dynamometer shall be fitted. The power delivered to the expeller may be supplied in the following ways:

- a) Direct coupling the prime mover with the main shaft of the expeller, and
- b) Connecting the prime mover with the help of flat or V-belt and pulleys with the main shaft of the expeller.

NOTE — In case of (a), the power delivered to the expeller would be the power output of the prime mover; whereas in case of (b), the allowances for 6 and 3 percent respectively may be made.

7.3 The expeller shall be run-in without load before commencing the test. The running in shall be carried out in accordance with the manufacturer's recommendation. In the absence of any recommendation by the manufacturer, the expeller shall be run-in for 30 minutes. During the period of run-in, adjustment for various functional components may be done. All the adjustments done shall be in accordance with the instructions contained in the instructions manual supplied by the manufacturer.

8 GENERAL TESTS

8.1 Checking of Specification

The specifications given by the manufacturer shall be checked and reported in the proforma given in Annex B.

8.2 Checking of Material

The material of construction of various components of the machine shall be reported in the data sheet given in Annex C.

8.3 Visual Observation and Checking of Provision for Adjustments

The observations and adjustments given in the data sheet in Annex D shall be made and reported.

9 TEST AT NO LOAD

9.1 Power Consumption

Run the expeller at no load for at least half-an-hour at the specified revolution of expelling unit and record the readings of the energy-meter at interval of 5 minutes. The difference between two consecutive readings shall give power consumption for 5 minutes. Calculate power consumption at no load for one hour. Record the data according to item (1) of Annex E.

9.2 Visual Observations

During and after completing power consumption test (see 9.1), the observation given in item (2) of Annex E shall be made visually and recorded.

10 TEST AT LOAD

10.1 Test Material

The test material shall be cleaned seed or kernel. Groundnut and mustard shall be preferred; these shall conform to IS 4427 : 1967 and IS 4428 : 1967 respectively. The quantity shall be sufficient to work the expeller for a period of 60 minutes after reading the normal working condition.

10.2 Condition of Cooking

The cooking temperature and the time of the oil seed shall be mentioned in the report.

10.3 Operation and Collection of Data

The expeller shall be operated at its specified speed and at maximum operating pressure/operational choke setting after achieving the normal steady state operation (outlet cake temperature has been stabilized) for 20 minutes at a feed rate slightly below the capacity specified by the manufacturer. During the run period collect the following sample and data:

- a) 4 sets of the samples of oil cake and oil from the relevant outlet at an interval of 5 minutes; and
- b) The speed of the main shaft and the reading of energy meter or dynamometer.

10.3.1 At the end of the 20 minutes feeding, run the expeller for some time so that practically no more material already fed comes out. The oil cake coming out of the expeller should be fed once again for extraction of remaining oil. At

the end of the test collect and weigh the oil and oil cake respectively. The mass of the sample collected should be added.

10.3.2 The test given at **10.3.1** shall be repeated for minimum of 2 times at 100 and 110 percent of the capacity declared by the manufacturer.

NOTE — For the purpose of certification, the test at **10.3** and **10.3.1** shall be conductable at the declared capacity of the manufacturer and test at **10.3.2** need not be conducted.

10.3.2.1 The data shall be recorded in accordance with Annex F.

10.4 Analysis of Samples

10.4.1 Determination of the Oil Content of Residual Cake

The oil content in the residual cake shall be determined in accordance with 7 of IS 7874 (Part 1) : 1975. The data shall be recorded in Annex F.

10.4.2 Determination of Acid Value in Oil

The acid value of the extracted oil sample shall be determined in accordance with 5.3 of IS 3579 : 1966. The data shall be recorded in Annex F.

10.5 Power Consumption

The power requirement of each feed rate shall be calculated in accordance with the **10.5.1** and **10.5.2**.

10.5.1 In case of prime mover fitted with energy meter the readings taken shall be the power consumption for 5 minutes. The power consumption per hour giving due allowance to the type of drive shall be calculated and reported.

10.5.2 In case of prime mover fitted with the dynamometer, the reading taken shall indicate the torque required. The power consumption per hour giving due allowance to the type of drive (see **7.2**) shall be calculated by the following formula:

$$P = \frac{T \times S}{973.363}$$

where

P = power, kW

T = torque, Nm

S = speed, rev/min

NOTE — For the purpose of certification, the power consumption at the declared feed rate shall only be calculated.

10.5.3 Record the data in accordance with Annex F.

10.6 Rated Input Capacity

Select the feed rate at which the residual oil in oil cake is not more than 8 percent with no change of acid value of oil from its original value. The capacity in terms of the energy consumed shall be calculated by dividing the capacity by power consumed and shall be expressed in kg/kWh. Record the data in Annex 'F'.

NOTE — For the purpose of certification, since the expeller has been operated only at declared capacity, it shall be seen whether the extraction efficiency is met at the declared capacity or not.

11 LONG RUN TEST

The expeller shall be operated for a minimum period of 20 hours at no load. This period should be covered in a maximum of 4 continuous runs. During and after the operation record the major breakdowns, defects developed and repairing made into the data sheet given in Annex 'G'.

ANNEX A (Foreword)

LIST OF SOME OF THE INDIAN STANDARDS ON OIL AND OILSEEDS

IS No.	Title	IS No.	Title
75 : 1973	Linseed oil, raw and refined (second revision)	3492 : 1965	<i>KARANJA</i> oil
435 : 1973	Caster oil (second revision)	4055 : 1966	Maize (corn) oil
542 : 1968	Coconut oil (second revision)	4088 : 1966	<i>KUSUM</i> oil
543 : 1968	Cottonseed oil (second revision)	4115 : 1967	Methods for sampling of oilseeds
544 : 1968	Groundnut oil (second revision)	4276 : 1977	Soyabean oil (first revision)
545 : 1984	<i>MAHUA</i> oil (third revision)	4277 : 1975	Sunflower oil (first revision)
546 : 1975	Mustard oil (second revision)	4429 : 1967	Grading for sesame seed for oil milling
547 : 1968	Sesame oil (second revision)	4617 : 1968	Grading for linseed for oil milling
3448 : 1984	Rice bran oil (second revision)	4618 : 1968	Grading for castor seeds for oil milling
3490 : 1965	Nigerseed oil		
3491 : 1965	Safflower oil		

IS No.	Title	IS No.	Title
4619 : 1968	Grading for <i>MAHUA</i> kernels for oil milling	7787 : 1975	Grading for <i>NEEM</i> kernels and depulped <i>NEEM</i> seed for oil milling
4620 : 1968	Grading for cottonseed for oil milling	7797 : 1975	Grading for soyabean for oil milling
4765 : 1975	<i>NEEM</i> kernel oil and depulped <i>NEEM</i> seed oil (<i>first revision</i>)	7798 : 1975	Grading for sunflower seeds for oil milling
5293 : 1969	Grading for niger seeds for oil milling	8557 : 1977	Grading for <i>KUSUM</i> kernels for oil milling
5294 : 1969	Grading for <i>KUSUM</i> seeds for oil milling	11068 : 1984	Criteria for edibility of oils and fats
5686 : 1970	Code of practice for handling and storage of oil seeds	11069 : 1984	Refined, bleached, hydrogenated, waterized and deodorized (RBHWD) Soyabean oil
6220 : 1971	Grading of copra for table use and for oil milling		

ANNEX B (*Clauses 4.2 and 8.1*)

SPECIFICATION SHEET

1 GENERAL

To be filled in by Manufacturer/Testing Station

- a) Make
- b) Model
- c) Serial number
- d) Year of manufacture
- e) Recommended oil seeds for milling
- f) Rated capacity, kg/h

2 POWER UNIT

- a) Type of prime mover
- b) Recommended power, kW
- c) Type of drive

3 OVERALL DIMENSIONS

- a) Length, mm
- b) Width, mm
- c) Height, mm
- d) Total mass, kg

4 CHAMBER

- a) Length, mm
- b) Bore of chamber, mm
 - i) without cage bar
 - ii) with cage bar
- c) Number of chamber plates
- d) Thickness of chamber plates, mm
- e) Chamber bars
 - i) Number
 - ii) Size

5 CAGE BARS

- a) Plain
 - i) Number
 - ii) Size (length × height × thickness), mm
- b) Side
 - i) Number
 - ii) Size (length × height × thickness), mm
- c) Taper
 - i) Number
 - ii) Size (length × height × thickness), mm
- d) Centre
 - i) Number
 - ii) Size (length × height × thickness), mm
- e) Spacing
 - i) Number
 - ii) Size (length × height × thickness), mm

6 GEAR SECTION

- a) Main Gear and Pinion
 - i) Number of teeth gear/pinion
 - ii) Outer diameter gear/pinion, mm
 - iii) Pitch circle diameter gear/pinion, mm, and
 - iv) Centre distance, mm.

b) Quill Worm Gear and Pinion

- i) Number of teeth gear/pinion
- ii) Outer diameter gear/pinion, mm
- iii) Pitch circle diameter gear/pinion, mm
- iv) Centre distance, mm

7 WORMS

- a) Diameter, mm
- b) Bore, mm
- c) Speed, rev/mm

8 KETTLE

- a) Type
- b) Heating area, m^2
- c) Steam pressure, MPa
- d) Consumption of steam, kg/h

9 TOOLS, ACCESSORIES, OPERATIONAL MANUAL AND SPARE PARTS PROVIDED

NOTE

- 1 The items which are not applicable in a particular expeller should be crossed while fitting.
- 2 If any other items are provided, their details should be given.

ANNEX C

(Clause 8.2)

DATA SHEET FOR MATERIAL OF CONSTRUCTION

Sl No.	Component	Material	Sl No.	Component	Material
a)	Body		f)	Chamber bar	
b)	Cage bar		g)	Frame bars	
c)	Worms		h)	Gears	
d)	Collar		j)	Pinion	
e)	Chamber plate		k)	Others	

ANNEX D

(Clause 8.3)

DATA SHEET FOR VISUAL OBSERVATION AND ADJUSTMENTS

1 OBSERVATIONS

- a) Adequacy of marking of inlet and outlets
- b) Adequacy of marking of direction of rotation of main worm
- c) Adequacy of protection of bearing against ingress of dust
- d) Adequacy of safety arrangement specially at moving parts
- e) Provision for lubrication of moving parts

- f) Provision of easy changing of components requiring frequent replacement
- g) Tightness of bolts and nuts and other fasteners
- h) Other observations
- j) Adequacy of belt tightening arrangements
- k) Adequacy of steam safety valve (when steam is used)

2 ADJUSTMENTS

- a) Feed rate
- b) Speed of main worm
- c) Pressure

ANNEX E
(Clauses 9.1 and 9.2)

DATA SHEET FOR TEST AT NO LOAD

1 POWER CONSUMPTION

- a) Source of power
- b) Type of drive
- c) Total time of run, min
- d) Energy meter readings at interval of 5 minutes
- e) Average consumption for one hour

2 OBSERVATIONS

- a) Presence of any marked vibration during operation
- b) Presence of undue knocking or rattling sound
- c) Any marked wear or slackness in any components
- d) Any marked rise in bearing temperature
- e) Other observations

ANNEX F

(Clauses 10.3.2.1, 10.4.1, 10.4.2, 10.5.3, and 10.6)

DATA SHEET FOR TEST AT LOAD

1 SOURCE OF POWER

4 ANY OTHER PRESS TREATMENTS (IF ANY)

2 POWER RATING

5 COOKING (IF DONE)

3 OILSEEDS USED

- a) Temperature of cooking, °C
- b) Duration of cooking, min

- a) Type of seed
- b) Variety
- c) Foreign matter, percent
- d) Moisture content, percent
- e) Oil content of seed, percent
- f) Acid value of oil

6 EXPELLER DETAIL

- a) Speed
- b) Pressure applied on seeds
- c) Operational choke setting

TEST DATA

Sl No.	Date	Starting Time	Stopping Time	Duration of Operation	Speed rev/min	Feed Rate kg/h	Power Required kW	No. of Samples	Quantity		Total Quantity of Oil Received at Oil outlet kg
									I	II	
									stage	stage	
									I	II	
									stage	stage	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
											i)
											ii)
											iii)
											iv)

7 OBSERVATIONS

- a) Presence of any marked vibration during operation

- b) Presence of any undue noise in operation
- c) Leakage of oil and cake
- d) Undue heating up of any components
- e) Other observations, if any

8 ANALYSIS OF SAMPLES**9 POWER CONSUMPTION, kW**

Sl No.	Feed Rate kg/h	Sample Mass g	Oil Content in Residual Cake	Acid Value of Oil
(1)	(2)	(3)	(4)	(5)
		i)		
		ii)		
		iii)		

For different feed rate, use data sheet as given above

10 RATED CAPACITY

- a) kg/h (1/day)
- b) kg/kWh

ANNEX G
(*Clause 11*)

DATA SHEET FOR LONG RUN TEST**1 TOTAL RUNNING TIME****4 ANY REPAIR CONDUCTED****2 CONTINUOUS RUNNING TIME****5 ANY OTHER OBSERVATION****3 ANY MAJOR BREAKDOWN**

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